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Moving beyond hand hygiene monitoring as a marker of infection prevention performance: development of a tailored infection control continuous quality improvement tool

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Abstract

Background

Infection Control practice compliance is commonly monitored by measuring hand hygiene compliance. The limitations of this approach were recognised in one acute healthcare organisation which led to the development of an infection control continuous quality improvement tool.

Methods

The Pronovost cycle, Barriers and Mitigation tool and Hexagon framework were used to review the existing monitoring system and develop a quality improvement data collection tool which considered the context of care delivery.

Results

Barriers and opportunities for improvement including ambiguity, consistency and feasibility of expectations, the environment, knowledge and education were combined in a monitoring tool which was piloted and modified in response to feedback. Local adaptations enabled staff to prioritise and monitor issues important in their own workplace.

The tool replaced the previous system and was positively evaluated by auditors. Challenges included ensuring staff had time to train in use of the tool, time to collect the audit and the reporting of low scores which conflicted with a target-based performance system.

Conclusions

Hand hygiene compliance monitoring alone misses other important aspects of infection control compliance. A continuous quality improvement tool was developed reflecting specific organisational needs which could be transferred or adapted to other organisations.

Introduction

Preventing infection in healthcare settings depends on the practices and behaviours of healthcare workers (HCW) and organisational factors that influence practice[1]. Hand hygiene has long been considered the most important infection prevention precaution[2] and hand hygiene audit data are reported at a senior level as part of quality assurance[3], overlooking the contribution of other important practices, for example isolation of infectious patients, and sterilisation and disinfection of equipment. The value of hand hygiene remains undisputed but despite regular monitoring and performance feedback, compliance is suboptimal[4,5.] Hand hygiene forms only part of an overall infection prevention program and its use as the overall indicator of infection prevention excellence is questionable, especially as monitoring is fraught with pitfalls. Hand hygiene compliance monitoring is commonly undertaken by directly observing practice [6] but this is flawed because HCWs are aware of scrutiny and transient improvement in performance may occur[7], generating inflated scores and not reflecting usual behaviour[8,9,10].

A review of the hand hygiene monitoring throughout one organisation found that the data which was based on observation of practice did not accurately reflect Infection Control compliance[11], contributed little to improving practice, was not considered the best use of time and lacked local credibility. These factors are likely to influence the value of these data in practice improvement[12].

Rationale

Achieving and maintaining high levels of infection control compliance is challenging[13], and few studies consider the context of care or barriers and opportunities to improve compliance[14]. Recognition of the context of and constraints on practice can provide insights into the opportunities for practice improvements. The collection of related data[15,16] includes the variability of activities, associated infection risks, and the importance of clarifying expectations of compliance. A data collection tool was required to provide credible information relating to a range of infection prevention practices, reflecting the operational risks and constraints encountered in different clinical settings and generating data of value for practice improvement. The aim of this work was to develop and implement an Infection Control performance and quality improvement data collection tool to meet the needs of a large, acute healthcare provider and to improve the credibility and utility of Infection Control performance monitoring.

Methods

The Infection Control Continuous Quality Improvement (IC-CQI) tool was developed in an acute teaching hospital, in London, with over 1200 inpatient beds and 8000 staff, spread across 7 hospitals on separate sites; providing emergency, general medicine, surgery, critical care, maternity, neonatal, and cancer services. Hand hygiene compliance monitoring was established but other aspects of infection control practice were not systematically monitored.

To create an Infection Control Continuous Quality Improvement tool and reporting framework the infection prevention team used Pronovost's Knowledge Translation Cycle[17] to review the current hand hygiene monitoring tool, and to develop a quality improvement data collection tool. The Barriers and Mitigation tool (BIM)[18] was used to identify workplace improvement barriers and potential solutions which involved 'walking the process': observing clinical processes and compliance measurement as they occurred in different clinical areas. A double loop learning cycle[19] was used to ensure that the context, values, assumptions and culture of the whole organisation were included in proposed quality improvement intervention using the Hexagon Tool[20] framework to assess feasibility and how to engage with stakeholders.

A variety of arrangements including questionnaires, day to day contacts with auditors, feedback from users via the IC-CQI data input system, discussion groups and IC-CQI training sessions were made for providing feedback on the data collection tool and process, to meet the operational needs, including time constraints, of different practitioners and clinical areas. Modifications to the tool and implementation of the change were made in response to feedback.

No other routine infection control performance data was collected apart from monthly hand hygiene compliance data collection and reporting which took place continuously across all clinical areas until this was replaced by the IC-CQI system. Intermittent validation was then undertaken of IC-CQI results including hand hygiene product availability, isolation practices, appropriateness of use of personal protective equipment and compliance with standards of invasive devices insertion and management throughout the implementation period.

Results

Results are reported using Pronovost's Knowledge Translation Cycle[17]

1. Summarise the science

A literature review focused on the current evidence for opportunities and barriers to compliance in infection control including hand hygiene which is the most researched infection control intervention and in addition evidence from related fields such as psychology. Five themes emerged which are summarised.

a) Knowledge, education and training

Improving infection control knowledge, education and training can enhance compliance and potentially reduce infection acquisition[21,22,23], although its impact and value is disputed[24,25]. The effect of education is difficult to gauge as it is one of a bundle of interventions in studies in which it has been judged to be beneficial[26,27,28,29.]

Further, improvements following education may not be sustained[30,31,32,] and may require continuous renewal to sustain reported effectiveness[29] though a limited ongoing residual effect has been reported[33]. The 'stickiness'[34] and memorability of ideas have influenced key concepts such as the 'My Five Moments of hand hygiene' concept[35] promoted by the World Health Organization which has been widely adopted as an approach to indicate when hands should be cleaned.

Lack of understanding of expectations, and ambiguity is a significant barrier to compliance, particularly with guidelines[36]. This is compounded by the considerable variation in the scope, approach, content, expectations and terminology in Infection Control guidance and recommendations[37,38]. Improving and clarifying infection control information and expectations may improve compliance[39], knowledge and high levels of self-efficacy are recognised to improve performance[40], whilst poor self-efficacy, despite good theoretical knowledge, is more likely to be associated with lower compliance[25].

b) Promotion of infection control requirements

The promotion of infection control compliance has been used widely in acute care settings with variable outcomes[41] and has included marketing[42,43,44], campaigns[45,46,47], stimulating[48,49,50], and reminding staff of infection control requirements[26,51]. Motivation associated with infection control is complex and appears to be related to culture, beliefs and

values. Emotion, habit/routine and incentives affect behaviour[52] and whilst pride in work, empathy, automatic habits and rewards may have a positive impact on compliance, sanctions could have a negative effect[52]. Other factors such as the protection of patients or self[53,54,55,56,] or the perception of risk may also affect performance[24,57,58,59].

c) Environmental and Human factors

The healthcare environment influences infection control compliance[60]including equipment design, position and workflow[61,62, 63]. Provision, availability and accessibility of hand hygiene facilities and products are important factors in hand hygiene compliance[64,65,66,67,68, 69]. Inadequate hand hygiene may be mitigated by reducing the environmental contamination of the patient environment including computer keyboards, and telephones[70]. Improving cleaning efficacy may reduce hand contamination[71,72]. However, this requires an environment designed to expedite cleaning, competent cleaning staff and sufficient time and opportunity to clean in busy clinical environments[73, 74].

Other significant barriers to infection control compliance include pressure of work, understaffing, overcrowding, high bed occupancy and patient turnover, high patient-to-nurse ratio and lack of time for education[22,25,75,76,77,78], which may contribute to infection transmission and outbreaks[79,80,81].

d) Organisational priorities and culture

In the UK, healthcare organisational performance is closely monitored and achievement of quality standards and performance targets is important[82]. Healthcare infection acquisitions are an important marker for the quality of care delivered and organisational management[83,84]. Effective infection prevention is typically a bundle of interventions[85]including isolation provision and practice, the use of personal protective equipment (PPE), cleanliness including environment, and hand hygiene.

Culture, commitment and leadership at unit or ward level affect the implementation of best practice[12,86,87], whilst organisational culture can influence, improve and sustain infection control compliance[81,88,89]. Strong leadership, good role models, local ownership, champions, empowerment, commitment and role have been found to be important[86,87,90].

e) Feedback of observation of practice

Performance feedback is widely used to improve hand hygiene performance[26,91,92,93] but has been found in other settings to be a potentially destructive process which demotivates and diminishes performance if not done well[94]. Behaviour changes related to observation[7], may promote 'good' behaviour[9] such as increasing hand hygiene compliance[8] with more pronounced effects when observers are known to the staff [95,96]. Another benefit of observation is the opportunity to check technique[27,97,98], praise, recognise constraints or offer advice and support. Clarifying and standardising expectations prior to observation may reduce inconsistency in expectations[99].

Observing sequences of care has been used as an alternative approach to simply observing hand hygiene practice[100,101,102]. The HCW is observed for the duration of the care activity such as mobilising a patient or measuring vital signs to enable the observer to put the actions observed into the context and constraints of practice.

2. Measure performance

The review of organisational data, in an acute NHS Trust, from 2008 to 2012 established that whilst reported levels of compliance were high (Figure1) and met the performance target of >90% compliance, the data collection method lacked validity and relaibility[11]. Nurses were responsible for data collection and it was perceived by some as 'ticking boxes' with no expectation that improvement would occur [11.] Many nurses had not received training in auditing hand hygiene, no time was allocated to undertake it and providing feedback was difficult, particularly if the results were poor[11]. Non-compliant staff were seldom challenged because of fear of a negative response. Factors impeding compliance such as empty soap dispensers or ambiguity of expectations were not resolved when observed as they should have been. Other issues reported by staff were inconsistent feedback about performance, inadequate facilities, dissatisfaction with products and supplies, lack of appropriate knowledge, ambiguity related to definitions, expectations and standards; and difficulty in observing single rooms without causing disruption. Infection control risks varied across the organisation and specialties. Misconceptions such when to wear disposable gloves were not managed or monitored, and there was a focus on identifying failures in compliance whilst good practice was unrecognised. Some staff including, medical staff, were largely disengaged from the process of monitoring and improving Infection Control practice.

3. Understand the current process and context of work

The context is summarised in six categories of the Hexagon framework which examines the current process and context of the proposed change[20].

(i) **Needs**

- Infection Control performance data provides assurance of compliance with national standards[103].
- Related audits including cleaning and environmental monitoring were not collated or widely disseminated
- The organisation was often blind to infection control issues until a significant problem emerged.

(ii) **Fit**

- The proposal reflected the core values of the organisation
- The organisation supported quality improvement and this initiative created opportunities for continuous improvement based on known and locally identified opportunities and barriers.
- It was an organisational priority that staff were competent and regularly updated in infection prevention and control.
- Some managers perceived that reporting low scores was an admission of failure rather than an opportunity for improvement which was a potential barrier.
- The potential to save time auditing, aligned with an organisational strategy to reduce costs and improve efficacy.

(iii) **Resource**

- No additional resource was required as this replaced the established data collection, reporting and dissemination infrastructure. Though it was recognised that in the existing system staff were often untrained and given no additional time to undertake this work[11]
- There was potential for a decreased dependence on nurses as data collection could be shared with other team members and undertaken throughout the 24-hour period.

(iv) **Evidence**

- There was evidence that the current system[12] lacked credibility and had little effect on improving reported compliance[11].
- There was evidence of systematic defects and barriers to infection control compliance including ambiguity, disengagement and unreliable hand hygiene product provision.

(v) **Readiness**

- Issues such as isolation were increasingly problematic and required improvement, particularly with the emergence of Ebola, SARS and MERS when considerable resource was required to ensure staff were educated and resourced to be able to manage these emerging viruses safely[104].

(vi) **Capacity**

- There was capacity within the Infection Control department to support the changes in the data collection and reporting, training, communication and validation of the data collected.
- A number of other competing changes and initiatives prevalent in the organisation including building, re-organisation of services and staffing structure were a potential barrier.

4. Ensure all patients reliably receive the intervention

Five key themes emerged from the literature review, BIM work[15,16], feedback from auditors and observations from stakeholders, suggesting barriers and opportunities for improvement which were combined to produce a draft IC-CQI tool. This was pilot tested in several areas while the existing hand hygiene monitoring arrangements continued throughout the remainder of the organisation (Figure 2). The draft IC-CQI tool was clarified and simplified in response to feedback. The rationale for including criteria in the final IC-CQI tool is summarised in Table1. Results of the pilot studies and the final IC-CQI tool was presented to senior managers, infection control staff and auditors who agreed that the results would be used to provide a monthly score of Infection Control performance (Table 2).

It took more than 3 years to develop the Infection Control Continuous Quality Improvement (IC-CQI) tool, educate staff in the purpose, methods and implications for practice and integrate the data into the established quality measurement system in the organisation. Over

100 hours of training in the final tool was delivered across the organisation and more than 150 people attended training in 2016-7.

The use of the IC-CQI tool was finally established throughout organisation in August 2016, and the existing hand hygiene audit discontinued. All areas were expected to report using the new tool from September 2016 (Figure 2). Progress developing and establishing the process is summarised below.

A. Knowledge including education and training

Mandatory training

Basic infection control training including hand hygiene is mandatory in the first month at work, with on-line updating every two years. Initially externally employed staff were excluded from this training and senior medical staff often opted out but during the development of the new tool this training became mandatory for all staff. Electronic training records were reported monthly to managers and the Executive team.

Knowledge

A list of common infection control questions was developed to assess the knowledge of healthcare workers and identify education requirements. Each ward or department were required to ask a representative sample of staff working in the area monthly either standard or locally developed and agreed questions.

Examples could include:

- When do you need to isolate a patient with diarrhoea?
- Describe how a spillage of blood should be cleaned up?

The infection control knowledge of auditors was a limiting factor and initially some auditors restricted questions to the ones they could answer. The range of questions and potential for improving infection control knowledge increased when answer sheets were provided.

Local education

An Infection Control link personnel system was already established to provide local induction and refresh basic skills and knowledge in the workplace, which included hand hygiene techniques, cleaning equipment and the use of personal protective equipment. Staff turnover was high particularly in junior doctors and the burden of local induction and support was onerous in some areas. Delivery varied across the organisation and reflected local commitment to the induction of new team members and the energy and commitment of the link staff.

B. Promotion and awareness

It was envisaged that prompts and reminders would increase awareness and that posters and screen savers could provide useful information such as the actions to take following a needle stick injury or how to clean equipment. However audible reminders confused some patients, irritated some staff and were rapidly removed or sabotaged by detractors. Some senior managers removed infection control notice boards as they found them ‘untidy’ and plans to install monitors failed as there was no space or electrical supply or funds. The most enduring promotion was hand hygiene technique stickers on hand hygiene product dispensers. In addition, regular supplies of posters were delivered to wards and departments.

C. Facilities (environmental and human factors)

Local managers were responsible for arranging maintenance, but the process could be onerous and protracted. Metrics relating to minor repairs were not collated and recurring problems were largely invisible. An issue mentioned frequently was empty or broken soap and alcohol hand gel dispensers. Organisation wide audits in 2013 found 18% of soap dispensers were broken or empty and there were examples of delays of several days before they were repaired. In 2013-4 a project was undertaken to replace all soap and alcohol hand gel dispensers with standardised products and dispensers which staff had positively evaluated. The condition of soap and gel dispensers was subsequently included in the IC-CQI tool and subsequent validated scores indicated a sustained improvement across the organisation.

D. Area specific factors

The range of specialties, workflows, client groups, facilities and infection risks provided a wide variety of area specific issues which emerged from staff observations, audits, feedback, complaints and root cause analysis. These included correcting air pressure in isolation rooms, staff refusing to remove wrist watches, parents visiting neonates whilst contagious, inappropriate disposable glove use and poor patient hand hygiene. Staff identified local issues requiring improvement and agreed expectations and actions. These were included in the daily handover, local education, knowledge assessment and the progress audited. Once improvement was demonstrated, monitoring could stop and switch to other issues of concern.

Some areas readily used this opportunity to identify, improve and monitor issues whilst others were reluctant to highlight problems as there was anxiety about producing a low score even for a short period. Sometimes encouragement was required to tackle an area of practice which was recognised as requiring improvement.

E. Observation of single room practice and sequences of care

Feedback indicated that observing practice was valued by staff as an opportunity to look at practice delivery and the environment. There was also a recognition that staff disliked covert observation and wanted to understand what was expected and how they could improve practice. Two types of observation; observing sequences of care and single room isolation practice, were identified in pilots as potentially useful and acceptable to HCWs and were subsequently adopted. Both required training auditors and clarification and agreement of expectations with practitioners and subsequent inclusion in local education.

Sequence of care monitoring requires the observer to compare the infection control expectation with performance, records data and offers an opportunity to provide feedback. Examples include observing doctors on a ward round or a nurse preparing and administering intravenous drugs. Sometimes it was difficult to understand what was monitored as documentation was often limited and it was not always possible to validate these observations.

Single room observation monitored isolation practice utilizing an audit tool. An observer records the infection control practice expectations and then whilst positioned outside the room, observes, records and offers feedback of performance. This may include infection control precautions taken by people entering and leaving the room, if the isolation sign was accurate and if adequate personal protective equipment was available. These data were simple to validate, and the tool was also used to check isolation practice compliance ad hoc to clarify expectations of new patients requiring isolation.

Evaluation of the IC-CQI tool

The IC-CQI tool (Table 2) was evaluated to assess acceptability to local auditors and managers[105] and if the results were perceived to be a fair reflection of performance[12]. At this

stage the assessment focused on the perspective of the auditors and those using the information rather than those being assessed.

In December 2016, 27% (6 of 22) of data collectors responding to on-line questionnaires had time allocated to undertake data collection. This had increased to 55% (27 of 49) by June 2017. Those trained in the use of the tool had also increased slightly from 44% (23 of 52) in 2013 to 48% (24 of 50) in 2017.

Use of the tool had increased to 100% (50 of 50 wards sampled) in 2017 and 64% (32 of 50) believed the tool had helped improve IC practice in their area. 70% (35) did not believe the tool had led to a decline in IC practice standards and 59% (29 of 49) believed the data were an accurate reflection of practice. In addition, auditors assessed observation, knowledge, education and promotion of awareness as the most valuable components of the tool, whilst at the same time the most difficult to collect (Figure 3). Data collectors/auditors consistently requested more training in the use of the tool, more prepared questions rather than locally developed questions and simplification of the data collection process.

Validation of the scores obtained was undertaken by the infection control team though some observations were difficult to validate particularly in the presence of local interpretations[12]. The utility of the tool and validity of the data collected continue to be evaluated. Infection reduction data is not reported here as it is unlikely that outcomes will be directly attributable to the use of the tool as other improvements and changes in care occur frequently such as increased isolation provision and increases in robotic surgery.

Discussion

Broadening the scope of monitoring to include other aspects of infection control practice beyond hand hygiene was hampered by a lack of a robust evidence base for some common infection control practices[106] and inconsistent opinions from subject matter experts[36]. This created some ambiguity of expectations of infection control practice, but consensus was often achieved when the rationale for practice was examined and options explored. The approach was sometimes uncomfortable for senior infection control staff but liberating for junior staff who were empowered to question entrenched habitual practice[107].

Changes in the focus of monitoring considered the value of knowledge, education, training and human factors and were readily accepted, but, despite evidence that local ownership and participation is beneficial[108] this was difficult to achieve. Staff were seldom allocated time to attend training or collect information and sometimes lost the momentum to identify new areas for local improvement. Lack of energy and resilience has been recognised previously in NHS staff and it has been suggested that this may be related to an underlying lack of engagement and absence of positive reinforcement for previous efforts[109]. These issues were particularly problematic when there was potential for reporting lower scores conflicting with the established organisational aspiration[110] of reporting high performance.

Resistance to acknowledging, and monitoring areas which required improvement was a recurring issue during the development and implementation of this tool. Whilst the fallibility of the previous monitoring system was recognised within the organisation, the use of soft intelligence provided by local observations and feedback[111] was a major departure from the normal practice of collecting data for assurance to one of improving practice[112]. Consequently, the assimilation of this change within the organisational was slow[113], and auditors reported persistent pressure from managers to achieve targets and avoid highlighting areas for improvement. At times this perpetuated the organisational blindness to problems and it was unclear if this influenced the priority given for time for training and data collection.

Establishing rational and feasible expectations of HCWs within the context of care delivery and providing information including data which was useful locally had a positive impact on engagement and acceptance of the changes introduced[12]. However, the flexibility and adaptability of the tool created inconsistencies and anomalies which hampered standardisation of practice and validation of results. The use of observation of practice was valued by auditors but standardisation of practice was simpler to achieve and validate when an unambiguous audit tool was provided e.g. the single room audit tool as this was less reliant of staff knowledge and local variations.

Summary

A widely used hand hygiene compliance monitoring system produced data which did not contribute to quality and safety improvement in one organisation and an alternative quality improvement tool was developed and implemented. Consideration of the context of care delivery led to the creation of a flexible and pragmatic tool which could be adapted. The

previous focus on hand hygiene compliance was replaced by monitoring performance in a range of Infection Control related factors.

Limitations

This work was undertaken in one organisation which may limit generalizability. The barriers and opportunities identified may vary in other organisations and facilities which may affect replication[114,115] although issues such as ambiguity, poor role models and knowledge are likely to be common. The tool is now established as a performance metric in the organisation and has been adopted and adapted in other healthcare organisations[105].

Conclusions

The removal of ambiguity, realistic expectations and local engagement contributed to the successful introduction and continued use of this tool. Further evaluation is required to establish the impact of this system in improving infection control practice.

References

1	Reason J, Parker D, Lawton R. Organizational controls and safety: The varieties of rule related behaviour. Journal of occupational and organizational psychology. 1998;71:289-304.
2	Allegranzi B, Pittet D. Role of hand hygiene in healthcare-associated infection prevention. Journal of Hospital Infection. 2009;73:305-15.
3	World Health Organization (WHO) World Alliance for Patient Safety: WHO Guidelines on Hand Hygiene in Health Care (Advance Draft). Global Patient Safety Challenge 2005-2006: Clean Care Is Safer Care. Geneva: WHO, 2006.
4	Sladek RM, Bond MJ, Phillips PA. Why don't doctors wash their hands? A correlational study of thinking styles and hand hygiene. American journal of infection control. 2008;36:399-406..
5	Korniewicz DM, El-Masri M. Exploring the factors associated with hand hygiene compliance of nurses during routine clinical practice. Applied Nursing Research. 2010;23:86-90.
6	WHO Guidelines on Hand Hygiene in Health Care: First Global Patient Safety Challenge Clean Care Is Safer Care. Geneva: World Health Organization; 2009. 1, Hand hygiene as a performance indicator. Available from: https://www.ncbi.nlm.nih.gov/books/NBK144028/

7	Roethlisberger FJ, Dickson WJ, Wright HA. Management and the Worker: An Account of a Research Program Conducted by the Western Electric Company, Hawthorn Works, Chicago. Cambridge, MA: Harvard University Press; 1949.
8	Srigley JA, Furness CD, Baker GR, Gardam M. Quantification of the Hawthorne effect in hand hygiene compliance monitoring using an electronic monitoring system: a retrospective cohort study. BMJ Qual Saf. 2014 Dec 1;23(12):974-80.
9	Wu KS, Lee SS, Chen JK, Chen YS, Tsai HC, Chen YJ, Huang YH, Lin HS. Identifying heterogeneity in the Hawthorne effect on hand hygiene observation: a cohort study of overtly and covertly observed results. *BMC Infect Dis*. 2018 Aug 6;18(1):369. doi: 10.1186/s12879-018-3292-5. PubMed PMID: 30081843; PubMed Central PMCID: PMC6090841
10	Gould DJ, Creedon S, Jeanes A, Drey NS, Chudleigh J, Moralejo D. Impact of observing hand hygiene in practice and research: a methodological reconsideration. Journal of hospital infection. 2017 Feb 1;95(2):169-74.
11	Jeanes A, Coen PG, Wilson AP, Drey NS, Gould DJ. Collecting the data but missing the point: validity of hand hygiene audit data. Journal of Hospital Infection. 2015; 90:156-62.
12	Dixon-Woods MA, Leslie M, Bion J, Tarrant C. What counts? An ethnographic study of infection data reported to a patient safety program. The Milbank Quarterly. 2012;90:548-91.
13	Azim S, McLaws ML. Doctor, do you have a moment? National Hand Hygiene Initiative compliance in Australian hospitals. Med J Aust. 2014;200:534-7.
14	Squires JE, Suh KN, Linklater S, Bruce N, Gartke K, Graham ID et al. Improving physician hand hygiene compliance using behavioural theories: a study protocol. Implementation Science. 2013;8:16
15	Jeanes A, Coen PG, Drey NS, Gould DJ. The development of hand hygiene compliance imperatives in an emergency department. American journal of infection control. 2018;46:441-7.
16	Jeanes A, Dick J, Coen P, Drey N, Gould DJ Hand hygiene compliance monitoring in anaesthetics: Feasibility and validity Journal of Infection Prevention 2018;19:116-122
17	Pronovost, P. J., Goeschel, C. A., Marsteller, J. A., Sexton, J. B., Pham, J. C., &Berenholtz, S. M.. Framework for patient safety research and improvement. Circulation, 2009;119:330-337.

18	Gurses AP, Murphy DJ, Martinez EA, Berenholtz SM, Pronovost PJ. A practical tool to identify and eliminate barriers to compliance with evidence-based guidelines. JtComm J Qual Patient Saf. 2009;35:526-32.
19	Argyris C, Schön D. Organizational Learning: A Theory of Action Perspective Massachusetts. Reading, Addison-Wesley. 1978.
20	Blase, K., Kizer, L., & Van Dyke, M.. The Hexagon Tool: Exploring context. 201) Chapel Hill, NC: National Implementation Research Network, FPG Child Development Institute, University of North Carolina at Chapel Hill.
21	Barrett R, Randle J. Hand hygiene practices: nursing students' perceptions. J ClinNurs. 2008;17:1851-7.
22	Knoll M, Lautenschlaeger C, Borneff-Lipp M. The impact of workload on hygiene compliance in nursing. British journal of nursing. 2010 Sep 9;19(16):S18-22.
23	Dyson J, Lawton R, Jackson C, Cheater F. Development of a theory-based instrument to identify barriers and levers to best hand hygiene practice among healthcare practitioners. Implementation Science. 2013;8:111.
24	Arenas MD, Sánchez-Payá J, Barril G, García-Valdecasas J, Gorriz JL, Soriano A et al M. A multicentric survey of the practice of hand hygiene in haemodialysis units:factors affecting compliance. Nephrol Dial Transplant. 2005;20:1164-71.
25	Wandell DD, Maes L, Labeau S, Vereecken C, Blot S. behavioural determinants of hand hygiene compliance in intensive care units. American Journal of critical care 2010;19;3:230-239
26	Pittet D, Hugonnet S, Harbarth S, Mourouga P, Sauvan V, Touveneau S et al. Effectiveness of a hospital-wide programme to improve compliance with hand hygiene. Infection Control Programme. Lancet. 2000;14;356:1307-12. Erratum in: Lancet 2000;356:2196.
27	Aboelela SW, Stone PW, Larson EL. Effectiveness of bundled behavioural interventions to control healthcare-associated infections: a systematic review of the literature. J Hosp Infect 2007; 66:101–8.
28	Schweizer ML, Reisinger HS, Ohl M, Formanek MB, Blevins A, Ward MA, Perencevich EN. Searching for an optimal hand hygiene bundle: a meta-analysis. Clinical infectious diseases. 2013 Oct 8;58(2):248-59.
29	Eveillard M, Raymond F, Guilloteau V, Pradelle MT, Kempf M, Zilli-Dewaele M et al. Impact of a multi-faceted training intervention on the improvement of hand hygiene and gloving practices in four healthcare settings including nursing

	homes, acute-care geriatric wards and physical rehabilitation units. J ClinNurs. 2011;20:2744-51.
30	Bittner M.J., Rich E.C., Turner P.D., Arnold W.H.. Limited impact of sustained simple feedback based on soap and paper towel consumption on the frequency of hand washing in an adult intensive care unit Infect. Control Hosp. Epidemiol., 2002;23:120–126
31	Salemi C., Canola M.T., Eck E.K. Hand washing and physicians: how to get them together Infect. Control Hosp. Epidemiol., 2002;23:32–35
32	Helder O, Latour J. Undergraduate nurse students' education in infection prevention: is it effective to change the attitude and compliance with hand hygiene?. Nursing in critical care. 2010;15:39-41.
33	Huang J., Jiang D., Wang X., Liu Y.,.Fennie K, Burgess J et al. Changing knowledge, behavior, and practice related to universal precautions among hospital nurses in China J. Contin. Educ. Nurs., 2002;33:217–224
34	Gladwell, M. The tipping point: How little things can make a big difference. 2002. New York: Little Brown.
35	Sax HS. A personal memory aid augmenting the 'My five moments for hand hygiene'concept. InBMC Proceedings BioMed Central 2011;5:28
36	Gurses AP, Seidl KL, Vaidya V, Bochicchio G, Harris AD, Hebden J et al. Systems ambiguity and guideline compliance: a qualitative study of how intensive care units follow evidence-based guidelines to reduce healthcare-associated infections. Quality and Safety in Health Care. 2008;17:351-9.
37	Kelsey MC. The management and control of hospital-acquired infection in acute NHS trusts in England: a report by the Comptroller and Auditor General–the who, how and what. Journal of Hospital Infection. 2000;44:157-9.
38	Cookson B, Mathai E, Allegranzi B, Pessoa-Silva CL, Nejad S,B Schneider A et al. Comparison of national and subnational guidelines for hand hygiene. J Hosp Infect. 2009;72:202-10.
39	Ong MS, Magrabi F, Post J, Morris S, Westbrook J, Wobcke W et al. Communication interventions to improve adherence to infection control precautions: a randomised crossover trial. BMC Infect Dis. 2013;13:72.
40	Ngo A, Murphy S. A Theory-based Intervention to Improve Nurses' Knowledge, Self-efficacy, and Skills to Reduce PICC Occlusion. Journal of Infusion Nursing. 2005;28:173-81.

41	Gould DJ1, Moralejo D, Drey N, Chudleigh JH, Taljaard M Interventions to improve hand hygiene compliance in patient care. Cochrane Database Syst Rev. 2017 Sep 1;9:CD005186. doi: 10.1002/14651858.CD005186.pub4.
42	Whitby M, McLaws ML, Slater K, Tong E, Johnson B. Three successful interventions in health care workers that improve compliance with hand hygiene: is sustained replication possible? Am J Infect Control. 2008;36:349-55.
43	Lederer JW Jr, Best D, Hendrix V. A comprehensive hand hygiene approach to reducing MRSA health care-associated infections. JtComm J Qual Patient Saf. 2009;35:180-5.
44	Forrester LA, Bryce EA, Mediaa AK. Clean Hands for Life: results of a large, multicentre, multifaceted, social marketing hand-hygiene campaign. J Hosp Infect.2010;74:225-31.
45	McLaws ML, Pantle AC, Fitzpatrick KR, Hughes CF. Improvements in hand hygiene across New South Wales public hospitals: clean hands save lives, part III. Med J Aust. 2009;191;S18.
46	Wetzker W, Bunte-Schönberger K, Walter J, Pilarski G, Gastmeier P, Reichardt C. Compliance with hand hygiene: reference data from the national hand hygiene campaign in Germany. Journal of Hospital Infection. 2016 Apr 1;92(4):328-31.
47	Yow O Callery S Vearncombe M A multifaceted approach to a successful and sustainable hand hygiene campaign in a large tertiary academic medical centre BMC Proc; 2011; 5; S6: 255.
48	Stewardson AJ, Sax H, Gayet-Ageron A, Touveneau S, Longtin Y, Zingg W, Pittet D. Enhanced performance feedback and patient participation to improve hand hygiene compliance of health-care workers in the setting of established multimodal promotion: a single-centre, cluster randomised controlled trial. The Lancet Infectious Diseases. 2016 Dec 1;16(12):1345-55.
49	Lent V, Eckstein EC, Cameron AS, Budavich R, Eckstein BC, Donskey CJ. Evaluation of patient participation in a patient empowerment initiative to improve hand hygiene practices in a Veterans Affairs medical center. Am J Infect Control. 2009;37:117-20
50	Longtin Y, Sax H, Allegranzi B, Hugonnet S, Pittet D. Patients' beliefs and perceptions of their participation to increase healthcare worker compliance with hand hygiene. Infect Control Hosp Epidemiol. 2009;30:830-9.

51	Judah G, Aunger R, Schmidt WP, Michie S, Granger S, Curtis V. Experimental pretesting of hand-washing interventions in a natural setting. Am J Public Health. 2009;99;S2:405-11.
52	Dyson J Lawton R Jackson C, Cheater F Does the use of a theoretical approach tell us more about hand hygiene behaviour? The barriers and levers to hand hygiene. JHI 2011;12:17-24
53	Efstathiou G, Papastavrou E, Raftopoulos V, Merkouris A. Factors influencing nurses' compliance with Standard Precautions in order to avoid occupational exposure to microorganisms: A focus group study. BMC nursing. 2011 Dec;10(1):1.
54	Borg MA, Benbachir M, Cookson BD, Redjeb SB, Elnasser Z, Rasslan O et al. Self-protection as a driver for hand hygiene among healthcare workers. Infect Control Hosp Epidemiol. 2009; 30:578-80.
55	Jang JH, Wu S, Kirzner D, Moore C, Youssef G, Tong A et al. A. Focus group study of hand hygiene practice among healthcare workers in a teaching hospital in Toronto, Canada. Infect Control Hosp Epidemiol 2010;31:144-50.
56	Scheithauer S, Oude-Aost J, Stollbrink-Peschgens C, Haefner H, Waitschies B, Wagner N et al. Suspicion of viral gastroenteritis does improve compliance with hand hygiene. Infection. 2011;39:359-62
57	Scheithauer S, Oberröhrmann A, Haefner H, Kopp R, Schürholz T, Schwanz T et al. Compliance with hand hygiene in patients with meticillin-resistant Staphylococcus aureus and extended-spectrum β-lactamase-producing enterobacteria. J Hosp Infect. 2010;76:320-3.
58	Hitoto H, Kouatchet A, Dubé L, Lemarié C, Kempf M, Mercat A et al. Impact of screening and identifying methicillin-resistant Staphylococcus aureus carriers on hand hygiene compliance in 4 intensive care units. Am J Infect Control. 2011;39:571-6
59	Park JH, Cheong HK, Son DY, Kim SU, Ha CM. Perceptions and behaviors related to hand hygiene for the prevention of H1N1 influenza transmission among Korean university students during the peak pandemic period. *BMC Infect Dis*. 2010 Jul 28;10:222. doi: 10.1186/1471-2334-10-222. PubMed PMID: 20663229; PubMed Central PMCID: PMC2922213.
60	Urlich R, Zimring C, Quan X, Joseph A, Choudhary R. The role of the physical environment in the hospital of the 21st century. The Center for Health Design. 2004

61	Stockley JM, Constantine CE, Orr KE, Association of Medical Microbiologists' New Hospital Developments Project Group. Building new hospitals: a UK infection control perspective. Journal of Hospital Infection. 2006; 62:285-99.
62	Anderson J, Gosbee LL, Bessesen M, Williams L. Using human factors engineering to improve the effectiveness of infection prevention and control. Critical care medicine. 2010; 38:S269-81.
63	Larson EL, Albrecht S, O'Keefe M. Hand hygiene behavior in a pediatric emergency department and a pediatric intensive care unit: comparison of use of 2 dispenser systems. Am J Crit Care. 2005;14:304-11
64	Suresh G, Cahill J. How" user friendly" is the hospital for practicing hand hygiene? An ergonomic evaluation. Joint Commission journal on quality and patient safety/Joint Commission Resources. 2007;33:171-9.
65	Cantrell D, Shamriz O, Cohen MJ, Stern Z, Block C, Brezis M. Hand hygiene compliance by physicians: marked heterogeneity due to local culture? Am J Infect Control. 2009;37:301-5.
66	Ahmed K Audit of hand hygiene at Broadmoor, a high secure psychiatric hospital. J Hosp Infect. 2010; 75:128-31
67	Kendall A, Landers T, Kirk J, Young E. Point-of-care hand hygiene: preventing infection behind the curtain. American journal of infection control. 2012 May 1;40(4):S3-10.
68	Kirk J, Kendall A, Marx JF, Pincock T, Young E, Hughes JM, Landers T. Point of care hand hygiene—where's the rub? A survey of US and Canadian health care workers' knowledge, attitudes, and practices. American journal of infection control. 2016 Oct 1;44(10):1095-101.
69	Thomas BW, Berg-Copas GM, Vasquez DG, Jackson BL, Wetta-Hall R. Conspicuous vs. customary location of hand hygiene agent dispensers on alcohol-based hand hygiene product usage in an intensive care unit. Journal of the American Association of Osteotomy 2009;109:263–7.
70	Smith SJ, Young V, Robertson C, Dancer SJ. Where do hands go? An audit of sequential hand-touch events on a hospital ward. Journal of hospital infection. 2012;80:206-11.
71	Lankford MG, Collins S, Youngberg L, Rooney DM, Warren JR, Noskin GA. Assessment of materials commonly utilized in health care: implications for bacterial survival and transmission. Am J Infect Control. 2006; 34:258-63.
72	Wilson AP, Smyth D, Moore G, Singleton J, Jackson R, Gant V et al. The impact of enhanced cleaning within the intensive care unit on contamination of

	the near-patient environment with hospital pathogens: a randomized crossover study in critical care units in two hospitals. Critical care medicine. 2011;39:651-8.
73	Dancer SJ, White L, Robertson C. Monitoring environmental cleanliness on two surgical wards. International journal of environmental health research. 2008;18:357-64.
74	Jeanes A. Keeping hospitals clean: how nurses can reduce healthcare-associated infection. Prof Nurse. 2005;20:35-7.
75	Muller MP, Carter E, Siddiqui N, Larson E. Hand hygiene compliance in an emergency department: the effect of crowding. Academic Emergency Medicine. 2015 Oct;22(10):1218-21.
76	Lee A, Chalfine A, Daikos GL, Garilli S, Jovanovic B, Lemmen S et al. Hand hygiene practices and adherence determinants in surgical wards across Europe and Israel: a multicenter observational study. Am J Infect Control. 2011;39:517-20
77	Hugonnet S, Chevrolet JC, Pittet D. The effect of workload on infection risk in critically ill patients. Critical care medicine. 2007 Jan 1;35(1):76-81.
78	Needleman J, Buerhaus P, Mattke S, Stewart M, Zelevinsky K. Nurse-staffing levels and the quality of care in hospitals. New England Journal of Medicine. 2002;346:1715-22.
79	Cimiotti JP, Aiken LH, Sloane DM, Wu ES. Nurse staffing, burnout, and health care–associated infection. American journal of infection control. 2012;40:486-90.
80	Dixon-Woods M, Baker R, Charles K, Dawson J, Jerzembek G, Martin G et al.. Culture and behaviour in the English National Health Service: overview of lessons from a large multimethod study. BMJ Quality & Safety. 2014;23:106-15.
81	Griffiths P, Renz A, Hughes J, Rafferty AM. Impact of organisation and management factors on infection control in hospitals: a scoping review. Journal of Hospital Infection. 2009;73:1-4.
82	Bevan G, Hood C. What's measured is what matters: targets and gaming in the English public health care system. Public administration. 2006;84:517-38.
83	Secretary of State for Health, editor. High Quality Care for All: NHS Next Stage Review Final Report 2008 The Stationery Office

84	Vincent C, Aylin P, Franklin BD, Holmes A, Iskander S, Jacklin A, Moorthy K. Is health care getting safer?.BMJ. 2008;337
85	Anthony T, Murray BW, Sum-Ping JT, Lenkovsky F, Vornik VD, Parker BJ et Evaluating an evidence-based bundle for preventing surgical site infection: a randomized trial. Archives of surgery. 2011;146:263-9.
86	Doron SI, Kifuji K, Hynes BT, Dunlop D, Lemon T, Hansjosten K, Cheung T, Curley B, Snydman DR, Fairchild DG. A multifaceted approach to education, observation, and feedback in a successful hand hygiene campaign. JtComm J QualPatientSaf. 2011;37:3-10.
87	Jamal, A., O'Grady, G., Harnett, E., Dalton, D., & Andresen, D. Improving hand hygiene in a paediatric hospital: a multimodal quality improvement approach. BMJ quality & safety 2012;21:171-176.
88	Creedon SA. Hand hygiene compliance: exploring variations in practice between hospitals. Nurs Times. 2008;104:32-5.
89	Grayson ML, Russo PL, Cruickshank M, Bear JL, Gee CA, Hughes CF et al,. Outcomes from the first 2 years of the Australian National Hand Hygiene Initiative. Med J Aust. 2011;195:615-9.
90	Albright J, White B, Pedersen D, Carlson P, Yost L, Littau C. Use patterns and frequency of hand hygiene in healthcare facilities: Analysis of electronic surveillance data. American journal of infection control. 2018 Oct 1;46(10):1104-9.
91	Berhe M, Edmond MB, Bearman G. Measurement and feedback of infection control process measures in the intensive care unit: Impact on compliance. Am J Infect Control. 2006; 34:537-9.
92	Cromer AL, Latham SC, Bryant KG, Hutsell S, Gansauer L, Bendyk HA, Steed R, Carney MC. Monitoring and feedback of hand hygiene compliance and the impact on facility-acquired methicillin-resistant Staphylococcus aureus. Am J Infect Control. 2008;36:672-7.
93	Aboumatar H, Ristaino P, Davis RO, Thompson CB, Maragakis L, Cosgrove S et al, Infection prevention promotion program based on the PRECEDE model: improving hand hygiene behaviors among healthcare personnel. Infect Control HospEpidemiol. 2012;33:144-51.
94	Kluger AN, DeNisi A. The effects of feedback interventions on performance: a historical review, a meta-analysis, and a preliminary feedback intervention theory. Psychological bulletin. 1996;119:254

95	Kohli E, Ptak J, Smith R, Taylor E, Talbot EA, Kirldand KB. Variability in the Hawthorne effect with regard to hand hygiene performance in high-and low-performing inpatient care units. Infection Control. 2009;30:222-5.
96	Dhar S, Tansek R, Toftey EA, Dziekan BA, Chevalier TC, Bohlinger CG, Fitch M, Flanagan ME, Chopra T, Marchaim D, Kaye KS. Observer bias in hand hygiene compliance reporting. Infection Control. 2010;31:867-8
97	Macdonald DJ, McKillop EC, Trotter S, Gray AJ. Improving hand-washing performance–a crossover study of hand-washing in the orthopaedic department. The Annals of The Royal College of Surgeons of England. 2006;88:289-91.
98	Pashman J, Bradley EH, Wang H, Higa B, Fu M, Dembry LM. Promotion of hand hygiene techniques through use of a surveillance tool. Journal of Hospital Infection. 2007;66:249-54.
99	Thornton GC, Zorich S. Training to improve observer accuracy. Journal of Applied Psychology. 1980;65:351.
100	Gould D. Nurses' hand decontamination practice: results of a local study. Journal of Hospital Infection. 1994;28:15-30.
101	Gould D, Chamberlain A. The use of a ward-based educational teaching package to enhance nurses' compliance with infection control procedures. Journal of clinical nursing. 1997;6:55-67.
102	Eveillard M, Hitoto H, Raymond F, Kouatchet A, Dubé L, Guilloteau V et al, Measurement and interpretation of hand hygiene compliance rates: importance of monitoring entire care episodes. Journal of Hospital Infection. 2009;72:211-7.
103	National Institute for Health and Care Excellence. Healthcare-associated infections: prevention and control in primary and community care. NICE clinical guideline 139. 2012.
104	Alsahafi AJ, Cheng AC. Knowledge, Attitudes and Behaviours of Healthcare Workers in the Kingdom of Saudi Arabia to MERS Coronavirus and Other Emerging Infectious Diseases. International Journal of Environmental Research and Public Health. 2016;13:1214.
105	Øvretveit J; Perspectives: answering questions about quality improvement: suggestions for investigators, International Journal for Quality in Health Care, 2017;29:137–142
106	Dancer SJ. Infection control: Evidence-based common sense. Infection, Disease & Health. 2016;21:147-53.

107	Keogh, B., Review into the quality of care and treatment provided by 14 hospital trusts in England: overview report, 2013. NHS England.
108	Ham C Improving NHS care by engaging staff and devolving decision-making: report of the review of staff engagement and empowerment in the NHS- London: King's Fund, 2014
109	Jeve YB, Oppenheimer C, Konje J. Employee engagement within the NHS: a cross-sectional study. International Journal of Health Policy and Management. 2015;4:85-90.
110	Bailey, C, Madden, A, Alfes, K, Robinson, D, Fletcher, L, Holmes, J et al. Evaluating the evidence on employee engagement and its potential benefits to NHS staff: a narrative synthesis of the literature. Health Services and Delivery Research, 2015;3:1-424.
111	Martin GP, McKee L, Dixon-Woods M. Beyond metrics? Utilizing 'soft intelligence' for healthcare quality and safety. Social science & medicine. 2015 ;142:19-26.
112	Solberg LI, Mosser G, McDonald S. The three faces of performance measurement: improvement, accountability, and research. The Joint Commission journal on quality improvement. 1997;23:135-47.
113	Greenhalgh T, Robert G, Macfarlane F, Bate P, Kyriakidou O. Diffusion of innovations in service organizations: systematic review and recommendations. The Milbank Quarterly. 2004;82:581-629.
114	Lomas J. Using Research to inform healthcare managers' and policy makers' questions: from summative to interpretive synthesis. Healthcare Policy. 2005;1:55-71.
115	Dixon-Woods M, Bosk CL, Aveling EL, Goeschel CA, Pronovost PJ. Explaining Michigan: Developing an Ex Post Theory of a Quality Improvement Program. The Milbank Quarterly. 2011;89:167-205.

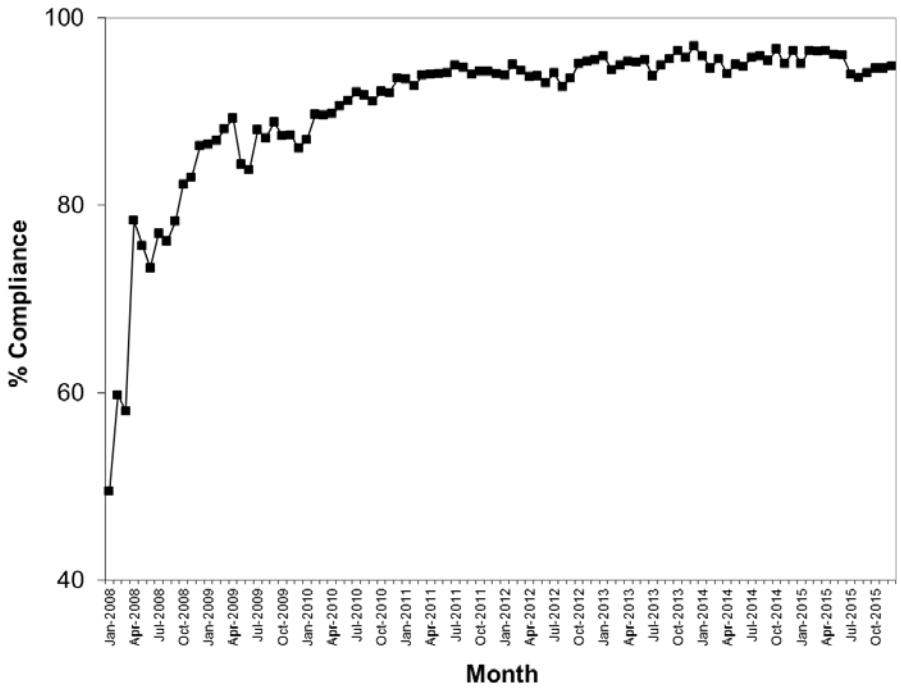

Figure 1. Hand hygiene compliance results averaged across all sites 2008-2015.

Figure 2. Hand hygiene audit compliance averaged across all sites (line) compared with the distribution of reporting: traditional audit tool (light grey bars), replaced by pilot (dark grey bars) and final version of IC-CQI tool (intermediate grey bars).

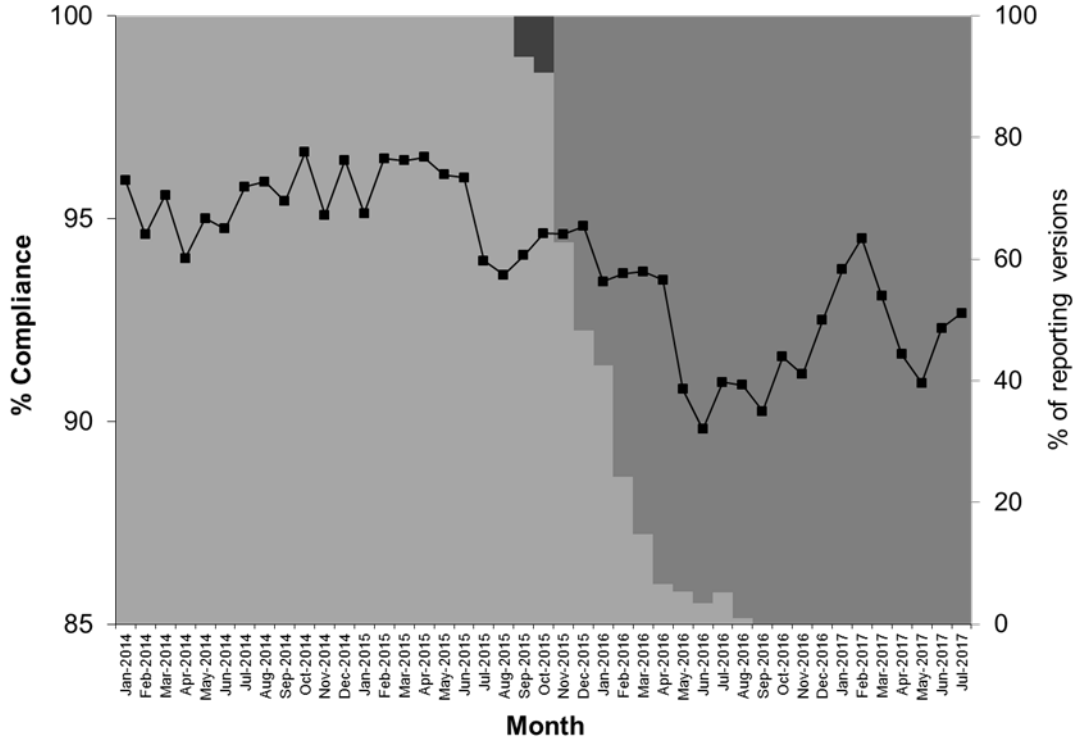

Figure 3 Feedback of the average value of tool components vs. average difficulty of data collection across 50 auditors (scale of 1-5 where 5 relates to greatest value and difficulty). Error bars are 95% credible intervals derived via bootstrap sampling.

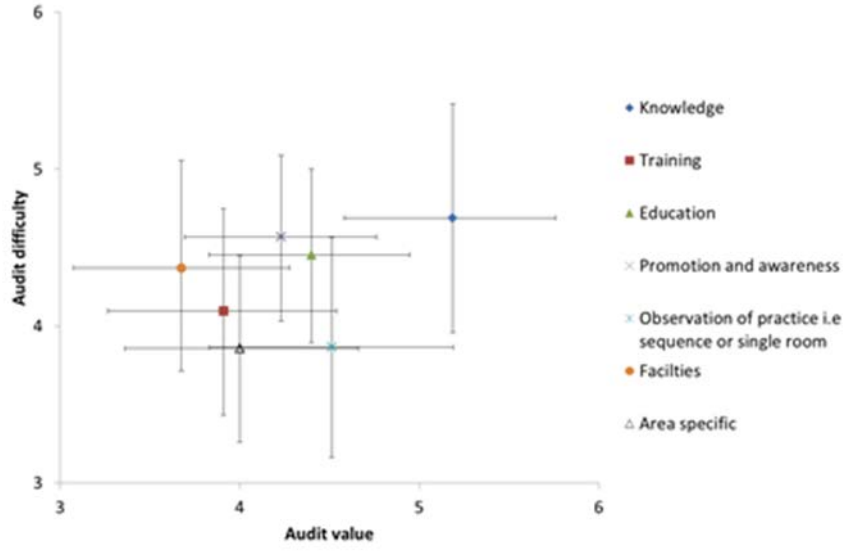

Table 1 Rationale for including criteria in the final IC-CQI tool

Criteria	Rationale for inclusion
Knowledge including education and training	
Mandatory Infection Control training	1. This was readily available data 2. Training at entry to the organisation (induction) and regular updates ensure the HCW is aware of the expected standards of practice, policies and guidance. 3. The level of staff training and education reflects the local and organisational commitment to the prevention of infection.
Knowledge	1. Regular assessment of current IC knowledge of staff identifies knowledge gaps 2. Provides evidence of success or failure of education 3. Identifies areas of confusion or inconsistent practice, which provides an opportunity to remove ambiguity and reinforce consistency in practice.
Local education	1. Local practice and facilities may vary 2. Regular local updates may clarify ambiguity 3. The presence of a visible, credible advisor ensures queries are promptly managed and learning is not delayed
Promotion and awareness	1. To maintain awareness and increase knowledge at local level 2. Reflects local ownership of Infection Control
Facilities	1. Provides information on environmental issues which are not resolved, deteriorating or where performance was suboptimal 2. Provides managers with information and evidence to assist in requests for improvement or investment 3. Clarifies standards expected.
Area specific factors	1. An opportunity to focus on issues important to each area and not included in organisation wide improvement strategies 2. Identification of an issue in one area could lead organisation wide learning.
Observation of single room practice and sequences of care	1. Observation of sequences included the context of care in the assessment 2. Isolation practice of single rooms could be observed 3. A visible monitoring presence potentially improved performance 4. Inclusion in the tool legitimised observation of practice (permission to stop and watch) 5. Observation enabled assessment of competence 6. Agreeing expectations prior to observing removed ambiguity

Table 2 Simplified example of Infection Control Continuous Quality Improvement tool (IC-CQI Tool)

	Examples of questions	Score
Training	Have all staff have received infection control training at induction and updates every 2 years?	
Knowledge	Select 5 staff each month and check knowledge of hand hygiene (or infection control issue relevant to your area) e.g. five questions for each member of staff	
Education	Is ward level training in hand hygiene established and underway? (This could include access to a training aid/trainer and dedicated time or sessions)	
Promotion/awareness/Information	Are hand hygiene posters and other signage in place? Is there clear and enough information displayed in the ward or department about how to wash and gel hands?	
Facilities	Is there alcohol gel at each bed end which is filled and working?	
	Are soap and hand towel dispensers filled, clean and working at each sink?	
	Are the alcohol gel dispensers at entrance and wall mounted dispensers filled and working?	
	Check taps – are they correctly adjusted for elbow operation?	
	Is gel available on desks, next to key boards and by notes trolleys?	
	Check key boards – are they being cleaned regularly?	
Area specific criteria	Examples include: Are patients provided with hand wipes at meal times? Is the environment clean and cleaned to a high standard? Is glove use appropriate?	
Observation	Single room/sequence of care observation	